

# THE FORBES HILL RANGE FERTILIZATION EXPERIMENT

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## Introduction.

Reasons for doing the experiment and details of the experimental design were given in the Proceedings for the 1983 Beef Cattle Field Day. A brief explanation of the experiment is available today as a separate item for those wishing more complete information.

Figure 1 shows how the experiment is laid out on the 520-acre Forbes Hill research site and Figures 2 and 3 show first-year (1982-83) results. Table 1 gives a first-year economic analysis (prepared by Dr. Melvin R. George, Agronomy & Range Science Cooperative Extension). Each person will have to decide whether the cost/return assumptions used will fit their operation under current resource cost and market return

Table 1. Preliminary analysis of first year economic returns.

| Treatment         | Treatment Cost <sup>2/</sup> | Extra Gain Needed <sup>3/</sup> | Beef Produced First Season 06/16/83 | Net Return From Treatment 06/16/83 <sup>4/</sup> |
|-------------------|------------------------------|---------------------------------|-------------------------------------|--------------------------------------------------|
|                   | \$/ac                        | lb/ac                           | lb/ac                               | \$/ac                                            |
| Control           | --                           | --                              | 88                                  | --                                               |
| 40N <sup>1/</sup> | 17.00                        | 27                              | 126                                 | 6.00                                             |
| 80N               | 28.00                        | 47                              | 153                                 | 10.00                                            |
| 40N+30P+33S       | 32.00                        | 51                              | 195                                 | 34.00                                            |
| 80N+30P+33S       | 44.00                        | 71                              | 215                                 | 34.00                                            |
| 30P+33S           | 15.00                        | 24                              | 128                                 | 9.00                                             |
| 60P+66S           | 25.00                        | 41                              | 175                                 | 28.00                                            |

1/ Nitrogen ws applied as urea; phosphorus and sulfur were applied as single superphosphate.

2/ Includes costs of fertilizer materials, plus \$4.25/ac application costs (\$8.50 for N + PS treatments), and interest charges at 12% for eight months. Values founded to nearest whole dollar.

3/ Lb/ac beef over control at \$0.62/lb. Values rounded to nearest pound.

4/ Rounded to nearest whole dollar.

conditions. Using the stated assumptions we could conclude 1) Costs were recovered from all fertilizer treatments by end of the first grazing season (we must acknowledge that 1982-83 was an exceptionally good weather year), and 2) Up to \$30 per acre return was realized from fertilized fields (as compared to the non-fertilized controls) due to a) higher stocking rates, and b) better animal (stocker steer) performance (daily gains). We underestimated the forage production response from the PS-only treatments; the fields were somewhat understocked and so the gains from those treatments were lower than they could have been. Improved animal performance on fields fertilized with single superphosphate (with or without nitrogen) seems to be maintained in the current (third) year. Average daily gains as measured on January 17, 1985 (see below) seem to indicate a quarter-pound advantage for the four treatments which included phosphorus and sulfur. We would not expect to see positive results from the fields treated with nitrogen alone in the third year, especially following the high-rainfall first season (about 45 inches), therefore we can include them along with the controls.

|           | ADG<br>1/17/85 |              |
|-----------|----------------|--------------|
| Control A | 1.43           | 1.56<br>1.54 |
| Control B | 1.70           |              |
| 40N       | 1.67           |              |
| 80N       | 1.36           |              |
|           |                | 1.52         |
| 40N+PS    | 1.96           | 1.90<br>1.80 |
| 80N+PS    | 1.84           |              |
| 30P33S    | 1.68           |              |
| 60P66S    | 1.87           |              |
|           |                | 1.78         |

### General Conclusions

We can summarize the significant general results of this experiment so far as outlined below.

- A. Normal costs of fertilizer materials and application were recovered in the first grazing season (in a good year) following fall application.
- B. Best results, under conditions of the experiment, were from the multiple-element (NPS) treatments. This was in part a reflection of the higher stocking rates employed in those treatments, but also because these soils are significantly lacking in all three nutrients.
- C. An extremely important element in recovery of fertilization benefits is the ability to properly adjust stocking rates to reflect the sometimes large seasonal changes in levels of forage production.
- D. In spite of reasonably comparable levels of grazing pressure (units of animal weight per unit weight of available forage) across treatments, stocker steer average daily gains were higher for fertilized fields, indicating significant benefits of fertilization to forage quality.
- E. Experience thus far suggests that in a growing season with normal length and weather conditions, the most important yield-limiting (at the animal level) factor is ability to adequately transfer the additional forage produced from fertilization to livestock which can efficiently convert it to gain.

### References

- Raguse, C. A., M. B. Jones, M. R. George, and K. D. Olson. 1983. Range fertilization studies at the UC Sierra Foothill Range Field Station. In: Proceedings, University of California Beef Range Field Day, April 8, 1983. Browns Valley, California.
- Raguse, C. A., J. L. Hull, M. B. Jones, J. G. Morris, M. R. George, K. D. Olson, K. L. Taggard, and R. E. Delmas. 1984. Range fertilization in Northern California - current experiments at the UC Sierra Foothill Range Field Station. In: Proceedings, 32nd Annual California Fertilization Conference, February 23-24, Fresno, California.
- Raguse, C. A., J. L. Hull, M. B. Jones, J. G. Morris, M. R. George, K. D. Olson, K. L. Taggard, and R. E. Delmas. 1984. Range fertilization in the Sierra Nevada foothills -- first report of a long-term study at the UC Sierra Foothill Range Field Station. California Agriculture 38(5&6):4-6.

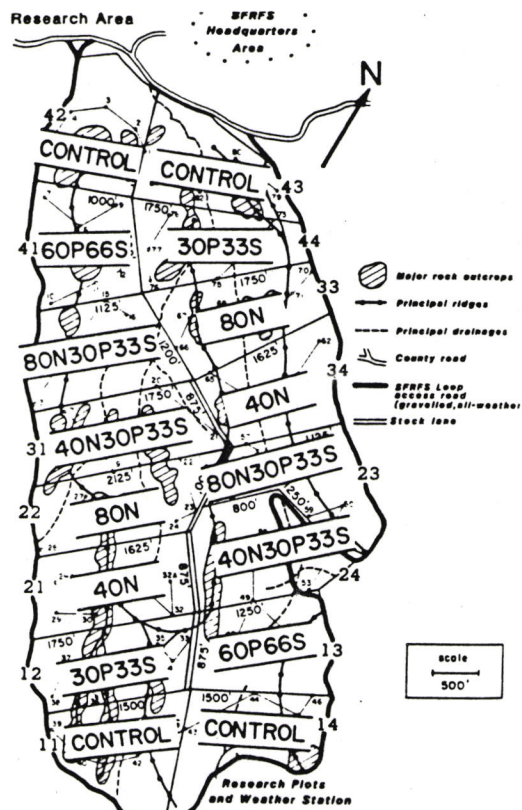


Fig. 1. Diagram of the field layout.

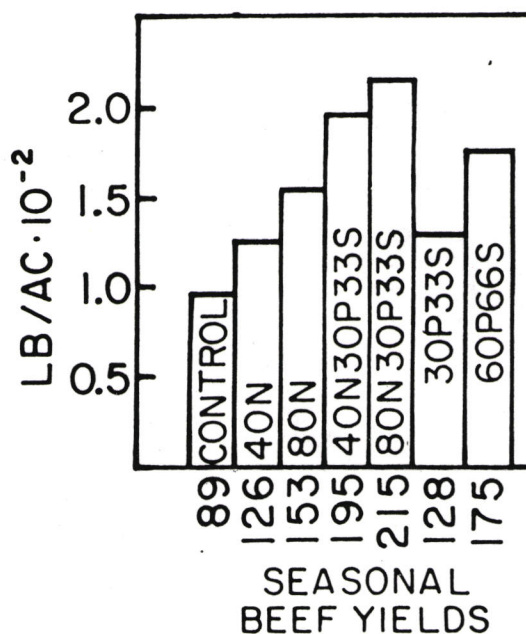


Fig. 2. First-year (1982-83) beef yields (based on stocker steer gains).

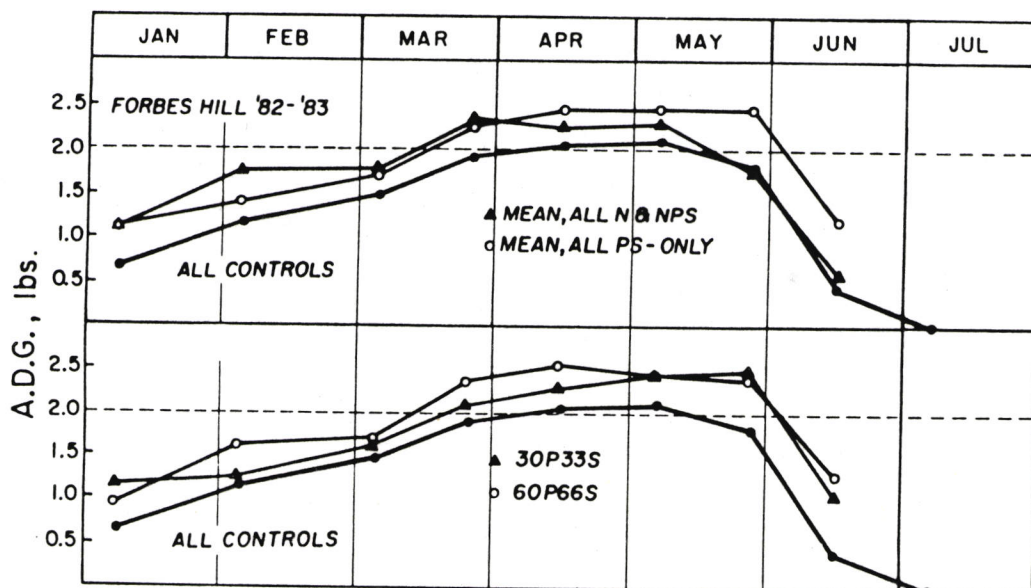


Fig. 3. Average daily gains for selected treatments and treatment combinations.